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(51) International Patent Classification ⁷ : G08B 3/10, H04M 19/04	A1	(11) International Publication Number: WO 00/43963
		(43) International Publication Date: 27 July 2000 (27.07.00)

With international search report.

SDOCID: <WO 0043963A1 | >

FOR THE PURPOSES OF INFORMATION ONLY

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Alert signal unit for an electronic device to compensate for
the influence of an environment

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The invention is related to electronic devices, and is related in particular to electronic devices which utilize alert signals to attract the attention of an user.

10 Background of the invention

Various electronic devices, such as mobile/cellular phones, beepers, pagers, computers, electronic scheduler, alarm clocks, and the like generate sensible signals (e.g. audible signals) which are used to attract the attention of the user. These kind of signals are referred to as alert signals hereafter. Especially for mobile electronic devices, the acoustic properties of a surrounding environment change frequently, for example in the case when an electronic device is used at different locations or the location wherein the electronic device is used is subjected to varying acoustic conditions. So, it is possible that an alert signal is not noticed by an user if the acoustic characteristics of the alert signal is not adapted properly to compensate the influence of the surrounding environment.

25

Known electronic devices producing alert signals have manually adjustable alert signals which are preset by an user to a desired signal type and signal volume. A certain presetting suited for a specific environment can be unsuitable for another environment. For example, if the electronic device is preset to produce low volume alert signals which are well-heard inside a house is used outside on the street or carried in a pocket or a bag, the produced alert signal might be overheard by the user.

35 In order to overcome this problem it is necessary to automatically adapt an alert signal of an electronic device depending

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on an ambient condition of an surrounding environment in such a way that the (acoustic) characteristics of the produced alert signal compensate for the influence of the environment and are properly adjusted to be noticed by an user in that specific environment, respectively.

As illustrated in Fig. 2, a device for adjusting the volume of an alert signal (a ringing tone) according to EP 0 507 482 A2 comprises a microphone, several signal processing means, a microprocessor, an amplifier and a loudspeaker. Ambient noise registered by the microphone is amplified and filtered by the signal processing means and the microprocessor compares the resulting signal indicative of the detected ambient noise with stored reference values, whereby for each reference value an empirical obtained suitable control signal is stored. Thus, the microprocessor supplies a proper control signal to trigger an alert signal of a volume suitable for the environment in which the ambient noise has been registered.

In a similar way, the alert signal control device for a telecommunication device as disclosed in WO 97/16932 detects an ambient condition of an environment in which the telecommunication device is used. Here, not only an ambient noise is detected but also the temperature of the environment and the motion of the telecommunication device within the environment can be registered. Based on a signal indicative of the ambient condition an alert signal is produced which is suitable to attract the attention of the user of the telecommunication device. This prior art device can produce not only acoustic alert signals but also optical and vibration alert signals. These different alert signals can be varied in type, amplitude, duration and frequency.

These known prior art devices provide improved alert signals in relation to an environment or an ambient condition. However, these devices produce still alert signals which may be not

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properly selected such that they are noticed by an user. For instance, when a telecommunication device as a mobile/cellular phone is placed in a pocket or a bag these prior art devices register a low noise level of the surrounding environment and will produce an alert signal having a low volume. But here it would be necessary to produce an alert signal having a rather high volume level such that the alert signal is noticed (heard) by an user.

Objects of the invention

Therefore, an object of the present invention is to overcome the above-mentioned problems of the prior art by providing a device for generating improved alert signals. More specifically, an object of the present invention is to provide a device for generating improved alert signals for an electronic device such as a telecommunication device or telephone which utilizes alert signals to attract the attention of an user. Furthermore, an object of the invention is to provide alert signals which are better adjusted to be noticed by an user by compensating the influence of an environment.

A further object of invention is to generate an alert signal having frequencies for which environment noise is lower and/or having amplitudes in relation to the amplitudes of environment noise. Also, an alert signal according to the invention can be adjusted with respect to its duration and/or sequence to compensate for the influence of an environment having different characteristics, such as repetitive noise.

Another further object of invention is to generate an alert signal properly adapted to various characteristics of an ambient condition.

Another object of the invention is generate an alert signal by deciding whether the environment has been changed compared to

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the normal environment. Additionally, the invention may provide an alert signal based on an analysis of the resulting alert signal within an environment.

Summary of the invention

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The present invention solves these above problems by providing an alert signal unit for an electronic device to compensate for the influence of an environment according to claim 1 which comprises a detection means connected to at least one sensor
10 for detecting an ambient condition and having a detection output for outputting a detection signal indicative of the ambient condition, a control means having a first control input connected to the detection output for receiving the detection signal and a control output for outputting a control signal in
15 response to the detection signal, and a generation means having a generation input connected to the control output for generating an alert signal in response to the control signal, and having a generation output for outputting the alert signal, whereby the control means has a second control input connected
20 to the generation output such that the alert signal is feeded back to the control means forming a closed loop for producing the control signal also in response to the alert signal.

This closed loop design of the alert unit according to the
25 invention ensures that alert signals in response to the ambient condition are produced such that the influence of the environment is compensated for.

Preferably, noise within the ambient condition is detected by
30 a microphone. In order to obtain a larger range of characteristics of the ambient condition, the invention can also use light and/or temperature and/or motion sensors.

The operation of the alert signal unit according to the inven-
35 tion may be initialized by a signal directed to the detection means, whereby it is to prefer that the signal is a signal of

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an incoming telephone call in case the invention is used in combination with an telephone (system) or the like.

5 Additionally, the control means of the invention comprises a combing circuitry for combing the received detection and alert signals. Based on a signal produced by the combing circuitry the control signal according to the invention is adapted to control the amplitudes and/or frequencies and/or duration and/or type of the alert signal.

10 The control means can also include an alert signal data base for producing the control signal to select a type of the alert signal and/or a data base comprising data related to ambient conditions for analyzing the received detection and alert
15 signals.

In order to increase the probability that an alert signal is noticed by an user, the control means further includes a transmitter for transmitting the control signal to a remote located
20 device for generating alert signals.

More specifically, the generating means (30) includes an analog signal generator or a digital signal processor to generate different types of alert signals, whereby it is to prefer that
25 the alert signal is an acoustic alert signal outputted by a loudspeaker connected to the generating means. Additionally, the generating means (30) further is connected to means for generating and outputting an optical alert signal and/or a vibration alert signal to generated improved alert signal.

30 Furthermore, the present invention provides an electronic device such as a telecommunication device according to claim 14.

35 In most cases an user is unable to predict the influence of an environment on an alert signal. So, he is also unable to pre-

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dict which alert signal will be the most suitable for that environment. But an user using the invention and/or an electronic device incorporating the invention has not to pre-set/pre-adjust an alert signal because the invention is capable
5 to generate an alert signal which is the most suitable alert signal for a specific environment. As a result, the probability that the user will notice (hear) an alert signal generated according to the invention is increased, especially within
10 environments outside the reference environment of the invention.

Although the present invention is described in combination with a (mobile/cellular) telephone it is obvious for those skilled in the art that the present invention is not limited thereto
15 but can be used in various electronic devices which utilize alert signals. By way of example, the present invention will be described more specifically with reference to the accompanying drawings.

20 Short description of the figures.

Fig. 1 illustrates an embodiment of the alert signal unit according to the present invention, and

25 Fig. 2 illustrates a prior art alert signal control device for a telephone.

Description of the preferred embodiment of the invention

30 The preferred embodiment of an alert signal unit according to the present invention for a telephone (e.g. mobile/cellular phone) includes a detection means 10, a control means 20 and a generation means 30 connected to each other by different signal lines, as shown in Fig. 2. The detection means 10 detects an
35 ambient condition of an environment in which the electronic device is used by a sensor 13 which is connected thereto. Here,

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the sensor 13 is the microphone of the telephone. But any special acoustic sensor may be used if the characteristics of the telephone microphone are not sufficient. The detection means circuit 11 receives a signal from the sensor 13 and generates a detection signal DS using different known signal processing means, such as A/D-converters, amplifiers, filter stages, demodulators, and the like. So, the detection means 10 generates a detection signal DS indicative of the ambient condition, such as environmental noise.

Additionally, the detection means 10 is connected other sensors such as light, temperature or motion sensors 15, 17, 19 to detect a larger range of characteristics of the ambient condition. So, the detection means 10 generates the detection signal DS indicative of more characteristics of the ambient condition.

Moreover, via an initializing input IniIN, the detection means 10 are provided a signal IS which initializes the operation thereof. Within the presently preferred embodiment, the initializing signal IS is a signal indicative of an incoming telephone call. But any type of initializing signal can be used to obtain a desired operation of the invention specific for a selected application.

The detection signal DS is transmitted via a detection output GenIN to a first input 1.ConIN of the control means 20. A control circuit and/or control microprocessor 21 thereof analyses the detection signal DS to produce a control signal CS which is suitable to drive the generation means 30 to generate an alert signal AS. The control circuit and/or control microprocessor 21 comprises signal processing components used to analyze incoming signals, such as frequency, phase and amplitude analyzers.

The generation means 30 receives the control signal CS via a control output ConOUT and the generation input GenIN and gener-

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ates the alert signal AS in response to the control signal CS, whereby the generation means 30 includes a generation circuit or a generation microprocessor 31. The generation circuit and the generation microprocessor 31, respectively, can be any of the known signal processing means, such as analog signal generators, digital signal processors, filter stages, amplifiers and the like. Via a generation output GenOUT, the generated alert signal AS is then transmitted to suitable alert signal emitting means, here a loudspeaker of the telephone.

Moreover, the alert signal AS is transmitted to a second input 2.ConIN of the control means 20 via the generation output GenOUT . As a result, the control means 20 obtain the detection signal DS and the alert signal AS such that the control means 20 produces the control signal CS according to the detected ambient condition indicated by the detection signal DS and according to the generated alert signal AS. This feedback of the alert signal AS to the control means 20 makes it possible to produce an improved control signal CS for the generation of an alert signal AS, which in turn is better adapted in relation to the detected ambient condition.

The control means 20 additionally produces the control signal CS using an alert signal data base 23 in which control signals CS for different types of alert signals AS are stored. Furthermore, the control means 20 includes a data base 25 in which data are stored which allows an improved analysis of the received detection and alert signals DS, AS and/or which contains reference values related to the received detection and/or alert signals DS, AS and/or which are related to interdependencies of the received detection and/or alert signals DS, AS and control signals CS to be produced. The data in data base 25 can be pre-stored and/or updated by the microprocessor 21 during an operation of the alert signal unit according to the invention.

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The control means 20 also includes a circuitry 27 connected to the first and second inputs 1.ConIN, 2. ConIN of the control means 20 for combining the detection and alert signals DS, AS. The combining circuitry 27 can be a summer, a weighting filter, or any known signal processing means or any combination thereof adapted to combine the detection and alert signals. Thus, a signal is produced comprising the received detection and alert signals DS, AS and signals corresponding thereto, respectively. The signal produced by the combining circuitry 27 is transmitted to the control microprocessor 21.

Moreover, the control means 20 comprises a transmitter 29 to transmit the control signal CS to remote located devices RLD for producing alert signals in case the analysis of the received detection and alert signals DS, AS indicates that the loudspeaker 33 would generate an alert signal AS which is not suitable, i.e. an alert signal AS which will be not noticed by an user.

In order to generate alert signals which are noticed by the user in such cases, the generation means 30 of the preferred embodiment are not only connected to the loudspeaker 33 to produce acoustic alert signals (ringing tones) but also connected to means for producing optical alert signals 35 (blinking lights) or vibration alert signals 37.

So, the invention provides an alert signal unit which generates improved alert signals according to an ambient condition of an environment in which an electronic device comprising the invention is used in such a way that the influence of the environment is compensated for. Although, the invention has been described with reference to telephones, it will be obvious to those skilled in the art that various modifications can be made and various applications are possible without leaving the scope of the present invention.

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Claims

1. An alert signal unit for an electronic device to compensate for the influence of an environment, comprising:

- a detection means (10) connected to at least one sensor for detecting an ambient condition and having a detection output (DetOUT) for outputting a detection signal (DS) indicative of the ambient condition,
- a control means (20) having a first control input (1.ConIN) connected to the detection output (DetOUT) for receiving the detection signal (DS) and a control output (ConOUT) for outputting a control signal (CS) in response to the detection signal (DS), and
- a generation means (30) having a generation input (GenIN) connected to the control output (ConOUT) for generating an alert signal (AS) in response to the control signal (CS), and having a generation output (GenOUT) for outputting the alert signal (AS), characterized in that
- the control means (20) has a second control input (2.ConIN) connected to the generation output (GenOUT) such that the alert signal (AS) is feeded back to the control means (20) forming a closed loop for producing the control signal (CS) also in response to the alert signal (AS).

2. The alert signal unit of claim 1, characterized in that one of the sensors connected to the detection means (10) is a microphone (13) for detecting the ambient condition.

3. The alert signal unit of claim 2, characterized in that the sensors connected to the detection means (10) further

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comprise a light sensor (15) and/or temperature sensor (17) and/or motion sensor (19).

4. The alert signal unit of one of the previous claims, characterized in that the detection means (10) further includes an input (IniIN) for receiving a signal (IS) initializing the detection means.

5. The alert signal unit of claim 4, characterized in that the initializing signal (IS) is a signal indicative of an incoming telephone call.

6. The alert signal unit of one of the previous claims, characterized in that the control means (20) further includes a combining circuitry (27) for combining the received detection and alert signal (DS, AS).

7. The alert signal unit of one of the previous claims, characterized in that the control means (20) further includes means for producing the control signal (CS) such that the control signal (CS) is adapted to control the amplitude and/or the frequency and/or the duration of the alert signal (AS) and/or that the control signal (CS) is adapted to select a type of the alert signal (AS).

8. The alert signal unit of one of the previous claims, characterized in that the control means (20) further includes an alert signal data base (23) for producing the control signal (CS) to select a type of the alert signal (AS).

9. The alert signal unit of one of the previous claims, characterized in that the control means (20) further includes a data base (25) comprising data related to ambient conditions for analyzing the received detection and alert signals (DS, CS).

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10. The alert signal unit of one of the previous claims, characterized in that the control means (20) further includes a transmitter (29) for transmitting the control signal (CS) to a remote located device (RLD) for generating alert signals.

5

11. The alert signal unit of one of the previous claims, characterized in that the generating means (30) further includes an analog signal generator or a digital signal processor (31).

10

12. The alert signal unit of one of the previous claims, characterized in that the generating means (30) includes a loudspeaker (33) for outputting the alert signal (AS).

15

13. The alert signal unit of one of the previous claims, characterized in that the generating means (30) further includes means for generating and outputting an optical alert signal (35) and/or a vibration alert signal (37).

20

14. An electronic device such as a telecommunication device comprising an alert signal unit according to one or more of the previous claims.

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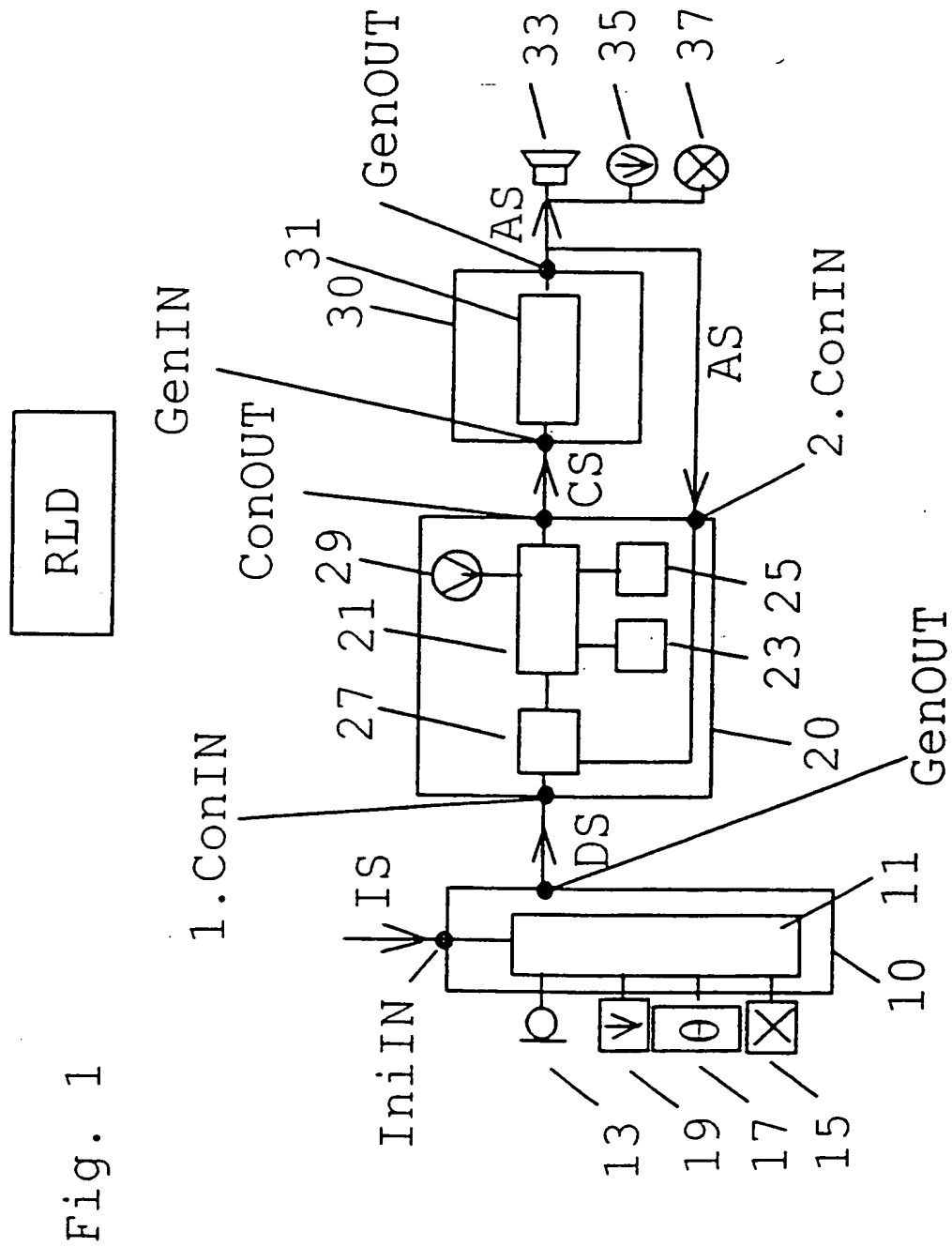
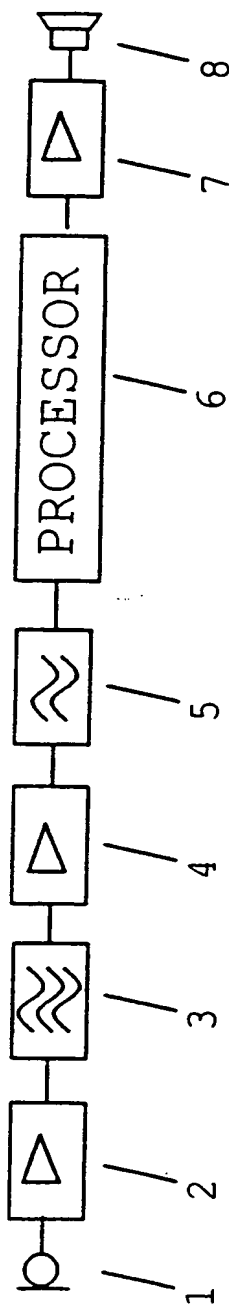


Fig. 2



INTERNATIONAL SEARCH REPORT

International Application No

PCT/GB 99/00254

A. CLASSIFICATION OF SUBJECT MATTER
 IPC 7 G08B3/10 H04M19/04

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 H04M G08B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X Y	EP 0 781 071 A (SAGEM) 25 June 1997 (1997-06-25) column 1, line 5 - line 9 column 1, line 30 - line 43 column 2, line 8 - line 9 column 2, line 35 - line 39 figure 1 ---	1, 2, 4-7, 11, 12, 14 3, 10, 13
E	WO 99 05850 A (NORTHERN TELECOM LTD) 4 February 1999 (1999-02-04) page 4, line 22 - page 5, line 11 page 8, line 3 - line 8 page 8, line 18 - page 9, line 20 page 11, line 8 - line 25 page 15, line 1 - line 8 figures 1, 3, 4 --- -/-	1, 2, 4-9, 11, 12, 14

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Date of the actual completion of the international search

10 September 1999

Date of mailing of the international search report

20/09/1999

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INTERNATIONAL SEARCH REPORT

International Application No

PCT/GB 99/00254

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
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INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

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